Trend Study 17-50-05

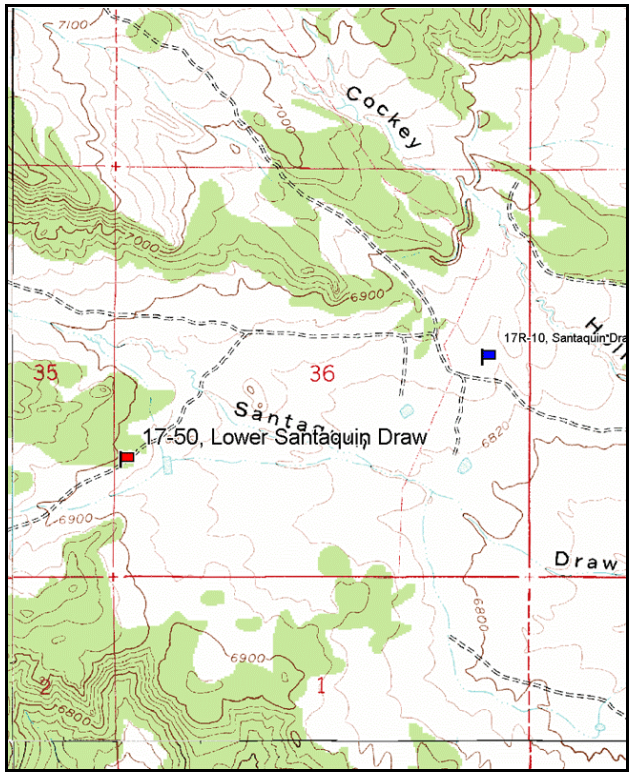
Study site name: Lower Santaquin Draw . Vegetation type: Wyoming Big Sagebrush .

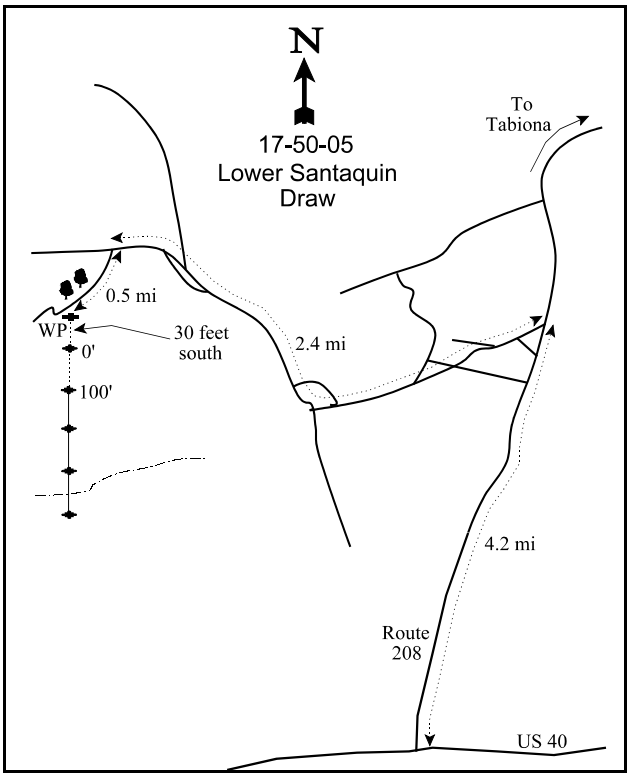
Compass bearing: frequency baseline 180 degrees magnetic.

Frequency belt placement: line 1 (11 & 83ft), line 2 (38ft), line 3 (54ft), line 4 (79ft).

LOCATION DESCRIPTION

From Highway U.S. 40, take Route 208 towards Tabiona for 4.2 miles and turn west onto a dirt road. Go 2.4 miles on the main road towards Santaquin Draw. Take the road to the left for 0.5 miles to the next intersection to a group of junipers and a witness post. From the witness post the 0-foot stake is 30 feet to the south. The 0-foot stake is marked with browse tag number 7021.





Map Name: Tabiona

Diagrammatic Sketch

Township 2S , Range 8W , Section 35

GPS: NAD 27, UTM 12T 4456389 N, 521680 E

DISCUSSION

Lower Santaquin Draw - Trend Study No. 17-50

The Lower Santaquin Draw trend study monitors a sagebrush-grass site on deer and elk winter range in Lower Santaquin Draw. The terrain has a slight slope of 5-8% on a southeast aspect and the elevation is approximately 6,900 feet. Low ridges covered with pinyon-juniper are within the immediate proximity of the study site. The surrounding woodland provides important escape and thermal cover. The area is obviously critical winter range as many antler sheds, winter-killed deer and pellet groups were observed during past readings. Numerous jackrabbit pellets and cattle pats were also observed during study establishment in 1982. Pellet group data taken in 2000 were estimated at 15 deer, 31 elk, and 8 cow days use/acre (37 ddu/ha, 77 edu/ha and 20 cdu/ha). About half of the deer pellet groups appeared to be from spring use with the other half from winter. About 75% of the elk pellet groups appeared to be from fall/winter use with the rest from spring use. The 2005 pellet group data estimates were 28 deer and 41 elk days use/acre (69 ddu/ha and 101 edu/ha), the seasons of use similar to those of the 2000 readings. This land is managed by the Division of Wildlife as part of the Tabby Mountain WMA.

Soils are alluvially deposited and deep but generally undifferentiated. The soil texture is a loam with few rocks on the surface or within the profile. Effective rooting depth is estimated at just over 10 inches. The soil would be expected to be much deeper, but were limited by soil compaction and a hardpan. Ground cover is fair for this type with percent relative bare ground ranging from 31% to 45% since 1982. Soil is very light textured and easily erodible. Sheet erosion is a factor, but it is greatly reduced by the levelness of the terrain and an adequate amount of vegetation and litter cover. However, stream courses in the area tend to be rather deep, steep-sided gullies, effectively lowering the immediate area's water table. There are active gullies around the site and a single 4-foot gully near the end of the baseline. The erosion index measurement in 2005 rated the soil erosion as slight, mainly because of large frequent pedestals surrounding shrubs and perennial grasses, gullies covering less than 2% of the site, some minor soil movement, minor litter movement, as well as small rills and flow patterns between perennial species.

The key browse species consists of a moderately dense stand of Wyoming big sagebrush. This site, like 17-49, contains sagebrush with characteristics of both mountain and Wyoming big sagebrush. All sagebrush at this location are considered Wyoming big sagebrush. Density remained similar from 1982 to 2000, around 5,000 plants/acre, but this number substantially decreased to 2,720 plants/acre by 2005. Utilization has continually been moderate to heavy, with varying percentages of plants with poor vigor. During the 1982 reading, 25% of the plants were decadent, 44% in 1988, 8% in 1995, 22% in 2000, and 44% in 2005. The individuals classified as dying in the population have increased from 2% in 1982, to 1% in 1988, to 4% in 1995, to 10% in 2000, to 32% in 2005. The number of young plants has also consistently declined since 1988, and it has gradually reached the point in 2005 where the percent of dying individuals have become more numerous than young in the population. The only other palatable browse species is a small but stable population of winterfat. Winterfat density has ranged from 866 plants/acre in 1982 to 1,460 in 2005. Use was moderate to heavy in 1982 and 1988, mostly light in 1995, and moderate to heavy again in 2000 and 2005. Less desirable browse occur in low numbers and consists of narrowleaf low rabbitbrush, broom snakeweed and pricklypear cactus.

The herbaceous understory is moderately abundant but only a few species are common. Grasses provided 13% cover in 1995, 17% in 2000, and 20% in 2005. Six grass species were identified, but crested wheatgrass dominates the composition. Forbs provided 4% cover in 1995, 3% in 2000, and 4% in 2005. Timber poisonvetch, Hood's phlox, and scarlet globemallow provide the majority of the forb cover.

1982 APPARENT TREND ASSESSMENT

Overall, this area appears to be relatively stable. Soil trend may be down slightly due to continuous low-level erosion and soil deposition, although the level terrain helps to minimize the effect. Wyoming big sagebrush may be slowly expanding. Grasses are being heavily impacted by livestock, which is thought to favor the shrub component. Forbs are insignificant forage sources and are generally undesirable species. Undesirable shrubs include pricklypear and narrowleaf low rabbitbrush, neither of which should be allowed to increase much beyond their present level.

1988 TREND ASSESSMENT

Due to a slight decrease in litter cover, there was a slight increase in bare soil cover in 1988. However, the level terrain limits erosion and the trend for soil is still considered stable. The density of the key browse species, Wyoming big sagebrush, remained similar to that of 1982. Vigor has improved since 1982. Most mature plants were moderately hedged rather than heavily hedged. However, a higher percentage (44%) of the sagebrush population was classified as decadent. There is still a substantial population of Wyoming big sagebrush seedlings and young. Average sagebrush cover is 21% on the study site. The trend for grasses and forbs are up due to a significant increase in quadrat frequency. Crested wheatgrass, the most abundant grass, tripled its quadrat frequency since 1982. Scarlet globemallow also greatly increased in quadrat frequency.

TREND ASSESSMENT
soil - stable (0)
browse - stable (0)
herbaceous understory - up (+2)

1995 TREND ASSESSMENT

Soil trend is up slightly. Percent bare ground declined from 38% to 33% and photos indicate a dramatic increase in herbaceous cover. The nested frequency of grasses and forbs have increased. Trend for sagebrush is slightly improved. Percent decadence has declined from 44% to 8%. It appears that many of the decadent plants surveyed in 1988 are now classified as healthy mature plants. The number of seedlings and young have declined but there are adequate numbers to maintain the population. The secondary browse, winterfat, also shows an improving trend. Heavy use is reduced, vigor is improved and percent decadency has decreased substantially from 15% to 2%. Cover and nested frequency of grasses has slightly improved. Nested frequency of forbs also showed slight increases in nested frequency with 11 perennial species counted. Overall, the herbaceous understory trend is considered stable. The Desirable Components Index rated this site as excellent with a score of 71 due to moderate browse cover, low decadency, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - slightly up (+1)
browse - slightly up (+1)
herbaceous understory - stable (0)
winter range condition (DC Index) - excellent (71) Lower Potential scale

2000 TREND ASSESSMENT

Trend for soil is stable. Relative percent cover of bare ground increased slightly while litter and vegetation cover declined slightly. However, cryptogamic cover increased and the ratio of protective ground cover (vegetation, litter and cryptogams) to bare ground remained similar to 1995 levels. There is some erosion occurring, but it is minimized by the gentle terrain. Trend for the key browse species, Wyoming big

sagebrush, is stable. Use is heavier than in 1995. The proportion of sagebrush in poor vigor has increased slightly and percent decadence has increased from 8% to 22%. This is still relatively low for this type of site. The number of seedlings and the proportion of young plants in the population have remained similar to 1995 levels and there appear to be enough young plants to maintain the population. Winterfat shows heavier use but has a stable population. Trend for the herbaceous understory is considered slightly down. Sum of nested frequency for perennial grasses has declined slightly, and perennial grasses contribute around 80% of the herbaceous cover. Sum of nested frequency for perennial forbs also declined substantially, with a corresponding drop in cover. The Desirable Components Index rated this site as excellent to good with a score of 67 due to moderate browse cover, moderate decadency, and good perennial grass cover.

TREND ASSESSMENT
soil - stable (0)
browse - stable (0)
herbaceous understory - slightly down (-1)
winter range condition (DC Index) - excellent to good (67) Lower Potential scale

2005 TREND ASSESSMENT

The trend for soil is slightly down. This decline in the soil trend is due to a decrease in the ratio of protective ground cover (vegetation, litter and cryptogams) to bare ground from 2.6:1 in 2000 to 2.3:1 in 2005. Bare ground cover increased slightly with a decrease in litter cover. The combination of an erosive soil texture, high bare ground cover, and low protective cover may impact soil stability on this study. The erosion index measurement also showed slight signs of recent erosion. The browse trend is down. The population density of the preferred browse species, Wyoming big sagebrush, decreased 45% from 2000 to 2005. Along with this decrease, the cover of sagebrush decreased from 9% to 6%. The decadent individuals increased from 22% of the population in 2000 to 44% in 2005 and those classified as dying increased from 10% to 32%. With 32% of sagebrush population classified as dying in 2005 and only 12% there was 20% of the population dying with out new plants to replace them. Winterfat density increased 25% from 2000 to 2005 with an improved vigor and decrease in percent decadence, but this increase could not compensate for the loss of sagebrush. The trend for herbaceous understory is stable. The nested frequencies of perennial grasses and forbs remained nearly unchanged. The percent cover of perennial species increased slightly, but this is a product of more precipitation the previous year, not an increase in numbers. The Desirable Components Index rated this site as good to excellent with a score of 63 due to moderate browse cover, high decadency, and good perennial grass and forb cover.

TREND ASSESSMENT
soil - slightly down (-1)
browse - down (-2)
herbaceous understory - stable (0)
winter range condition (DC Index) - good to excellent (63) Lower Potential scale

HERBACEOUS TRENDS --
Management unit 17 , Study no: 50

Type	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
G	Agropyron cristatum	$_{b}$307	$_{c}$331	$_{bc}$319	$_{a}$263	12.21	16.75	18.44
G	Agropyron dasystachyum	$_{a}$-	$_{bc}$13	$_{b}$9	$_{c}$30	.02	.05	.47

Type	Species	Nested Frequency				Average Cover %		
		'88	'95	'00	'05	'95	'00	'05
G	Carex sp.	$_{b}$37	$_{a}$9	$_{a}$10	$_{a}$5	.07	.10	.01
G	Oryzopsis hymenoides	$_{ab}$15	$_{a}$9	$_{a}$2	$_{b}$32	.22	.04	.30
G	Poa secunda	-	-	-	1	-	-	.03
G	Stipa comata	$_{a}$-	$_{ab}$13	$_{a}$7	$_{b}$21	.30	.06	.81
Total for Annual Grasses		0	0	0	0	0	0	0
Total for Perennial Grasses		359	375	347	352	12.84	17.01	20.07
Total for Grasses		359	375	347	352	12.84	17.01	20.07
F	Allium sp.	-	2	-	-	.00	-	-
F	Astragalus convallarius	$_{a}$4	$_{b}$20	$_{ab}$18	$_{b}$25	.78	.09	.31
F	Astragalus tenellus	$_{a}$-	$_{b}$6	$_{a}$-	$_{ab}$4	.19	-	.16
F	Calochortus nuttallii	-	3	-	4	.01	-	.01
F	Chenopodium leptophyllum(a)	-	-	-	2	-	-	.00
F	Cordylanthus kingii (a)	-	1	-	-	.01	-	-
F	Descurainia pinnata (a)	-	$_{a}$1	$_{a}$-	$_{b}$16	.00	-	.08
F	Draba sp. (a)	-	5	-	-	.01	-	-
F	Lappula occidentalis (a)	-	$_{a}$-	$_{a}$-	$_{b}$60	-	-	1.76
F	Leucelene ericoides	-	-	8	1	-	.04	.01
F	Lygodesmia grandiflora	-	-	-	1	-	-	.00
F	Machaeranthera canescens	$_{ab}$2	$_{b}$10	$_{a}$-	$_{ab}$7	.02	-	.07
F	Phlox hoodii	$_{b}$79	$_{b}$77	$_{b}$72	$_{a}$35	2.02	1.77	.66
F	Phlox longifolia	20	25	10	17	.06	.02	.21
F	Schoencrambe linifolia	2	3	-	4	.01	-	.01
F	Senecio multilobatus	1	-	-	-	-	-	-
F	Sphaeralcea coccinea	$_{b}$143	$_{ab}$121	$_{a}$109	$_{a}$106	.98	.65	2.44
F	Tragopogon dubius	-	-	1	-	-	.00	-
F	Trifolium gymnocarpon	$_{a}$6	$_{ab}$20	$_{a}$11	$_{b}$27	.17	.02	.38
Total for Annual Forbs		0	7	0	78	0.02	0	1.85
Total for Perennial Forbs		257	287	229	231	4.26	2.62	4.28
Total for Forbs		257	294	229	309	4.29	2.62	6.14

Values with different subscript letters are significantly different at alpha = 0.10

BROWSE TRENDS --
Management unit 17 , Study no: 50

Type	Species	Strip Frequency			Average Cover %		
		'95	'00	'05	'95	'00	'05
B	Artemisia tridentata wyomingensis	87	80	67	10.30	9.44	5.72
B	Ceratoides lanata	35	34	41	.62	1.03	1.88
B	Chrysothamnus depressus	0	1	0	-	-	-
B	Chrysothamnus nauseosus graveolens	0	12	0	-	.69	-
B	Chrysothamnus nauseosus hololeucus	9	1	5	.33	.00	-
B	Chrysothamnus viscidiflorus stenophyllus	5	5	8	.31	.30	.31
B	Gutierrezia sarothrae	3	1	0	.06	-	-
B	Leptodactylon pungens	3	0	1	.01	-	.03
B	Opuntia sp.	28	34	19	.44	.76	.91
B	Pediocactus simpsonii	0	2	1	-	.00	-
B	Purshia tridentata	0	0	0	-	.15	-
Total for Browse		170	170	142	12.09	12.38	8.87

CANOPY COVER, LINE INTERCEPT --
Management unit 17 , Study no: 50

Species	Percent Cover '05
Artemisia tridentata wyomingensis	4.58
Ceratoides lanata	1.20
Chrysothamnus nauseosus graveolens	.15
Chrysothamnus nauseosus hololeucus	.10
Chrysothamnus viscidiflorus stenophyllus	.36
Opuntia sp.	.08

KEY BROWSE ANNUAL LEADER GROWTH --
Management unit 17 , Study no: 50

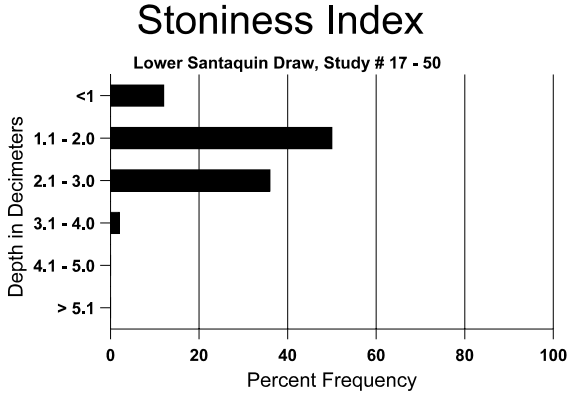
Species	Average leader growth (in) '05
Artemisia tridentata wyomingensis	1.7
Ceratoides lanata	3.4

BASIC COVER --
Management unit 17 , Study no: 50

Cover Type	Average Cover %				
	'82	'88	'95	'00	'05
Vegetation	6.50	7.00	32.09	31.07	31.29
Rock	0	0	.15	0	.00
Pavement	0	0	.01	.02	.04
Litter	58.50	53.00	39.47	40.61	25.48
Cryptogams	0	1.75	1.44	4.18	3.39
Bare Ground	35.00	38.25	32.60	44.56	49.93

SOIL ANALYSIS DATA --
Herd Unit 17, Study # 50, Study Name: Lower Santaquin Draw

Effective rooting depth (in)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	ppm P	ppm K	dS/m
10.6	61.4 (15.4)	7.6	45.3	36.2	18.6	1.0	2.0	99.2	0.5



PELLET GROUP DATA --
Management unit 17 , Study no: 50

Type	Quadrat Frequency		
	'95	'00	'05
Rabbit	4	15	12
Elk	17	28	45
Deer	29	15	31
Cattle	-	4	2

Days use per acre (ha)	
'00	'05
-	-
4 (10)	41 (101)
139 (342)	28 (69)
8 (20)	-

BROWSE CHARACTERISTICS --
Management unit 17 , Study no: 50

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Artemisia tridentata wyomingensis												
82	**5065**	1866	1266	2533	1266	-	41	28	25	2	34	20/23
88	**4999**	733	1333	1466	2200	-	45	13	44	.80	3	19/23
95	**5420**	180	880	4100	440	500	66	17	8	4	6	18/30
00	**5020**	100	760	3160	1100	420	53	24	22	10	13	18/26
05	**2760**	300	320	1220	1220	2100	29	24	44	32	32	18/27
Ceratoides lanata												
82	**866**	-	-	666	200	-	46	31	23	-	8	10/8
88	**1333**	66	600	533	200	-	20	25	15	-	10	6/8
95	**1040**	60	80	940	20	-	8	2	2	-	4	11/13
00	**1100**	-	40	1000	60	-	44	45	5	4	4	7/8
05	**1460**	580	280	1120	60	-	41	26	4	1	1	9/13
Chrysothamnus depressus												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**20**	-	-	20	-	-	100	0	-	-	0	-/-
05	**0**	-	-	-	-	-	0	0	-	-	0	-/-
Chrysothamnus nauseosus graveolens												
82	**0**	-	-	-	-	-	0	0	0	-	0	-/-
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
95	**0**	-	-	-	-	-	0	0	0	-	0	-/-
00	**240**	-	40	160	40	-	8	8	17	8	8	19/20
05	**0**	-	-	-	-	-	0	0	0	-	0	16/15

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Chrysothamnus nauseosus hololeucus												
82	**0**	-	-	-	-	-	0	0	0	-	0	-/-
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
95	**200**	-	20	160	20	-	0	0	10	10	10	20/21
00	**40**	-	40	-	-	-	0	0	0	-	0	-/-
05	**120**	-	-	80	40	20	33	17	33	17	33	17/18
Chrysothamnus viscidiflorus stenophyllus												
82	**133**	-	-	133	-	-	0	0	0	-	0	14/9
88	**332**	-	133	133	66	-	0	0	20	6	20	24/15
95	**300**	-	-	300	-	-	0	0	0	-	0	13/17
00	**280**	20	-	280	-	-	0	0	0	-	0	8/18
05	**320**	-	80	240	-	-	0	0	0	-	0	9/11
Eriogonum corymbosum												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**0**	-	-	-	-	-	0	0	-	-	0	-/-
00	**0**	-	-	-	-	-	0	0	-	-	0	-/-
05	**0**	-	-	-	-	-	0	0	-	-	0	7/14
Gutierrezia sarothrae												
82	**0**	-	-	-	-	-	0	0	-	-	0	-/-
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**80**	-	-	80	-	-	0	0	-	-	0	5/6
00	**20**	-	-	20	-	-	0	0	-	-	0	-/-
05	**0**	-	-	-	-	-	0	0	-	-	0	6/10
Leptodactylon pungens												
82	**2000**	-	600	1400	-	-	0	0	-	-	0	1/7
88	**0**	-	-	-	-	-	0	0	-	-	0	-/-
95	**60**	40	60	-	-	-	0	0	-	-	0	2/3
00	**0**	60	-	-	-	-	0	0	-	-	0	-/-
05	**20**	-	-	20	-	-	0	0	-	-	0	-/-
Opuntia sp.												
82	**533**	-	-	533	-	-	0	0	0	-	0	3/7
88	**866**	66	200	333	333	-	8	0	38	-	69	3/8
95	**940**	20	100	800	40	-	0	0	4	2	2	5/11
00	**1180**	-	140	940	100	-	0	0	8	8	8	4/9
05	**520**	20	20	460	40	80	0	0	8	4	4	4/12

		Age class distribution (plants per acre)					Utilization					
Year	Plants per Acre (excluding seedlings)	Seedling	Young	Mature	Decadent	Dead	% moderate	% heavy	% decadent	% dying	% poor vigor	Average Height Crown (in)
Pediocactus simpsonii												
82	**0**	-	-	-	-	-	0	0	0	-	0	-/-
88	**0**	-	-	-	-	-	0	0	0	-	0	-/-
95	**0**	-	-	-	-	-	0	0	0	-	0	-/-
00	**40**	-	20	-	20	-	0	0	50	50	50	0/2
05	**20**	-	-	20	-	-	0	0	0	-	0	1/2